# Template Week 1 – Bits & Bytes

Student number: 568403 (Kiarash Delavar)

## Assignment 1.1: Bits & Bytes Intro:

### 1- What are Bits & Bytes?

**The Bit:** is the smallest unit of data in a computer, representing a value of either **0 or 1**. It serves as the basic building block of binary code, the language of computers, where each bit signifies a binary choice such as On or Off or True or False. Bits are fundamental to all digital data representation.

**Bytes:** A byte consists of 8 bits and is the standard unit used to represent a character of data such as a letter or symbol. It can represent 256 different values (0-255 in decimal) and is commonly used to measure file sizes and memory capacity. Hierarchically, data is often measured in bytes, kilobytes (KB), megabytes (MB), gigabytes (GB), and terabytes (TB).

### 2- What is a nibble?

**Nibble:** is a small piece of data in computers that's made up of 4 bits. It's often used to represent a single number or letter in the hexadecimal system (it's like half of a byte).

### 3- What relationship does a nibble have with a hexadecimal value?

**A nibble** is 4 bits and each hexadecimal digit is also 4 bits. So one **nibble** can represent exactly one hexadecimal digit.

### 4- Why is it wise to display binary data as hexadecimal values?

**Binary numbers** are long and hard to read so it's easier to use hexadecimal. Each hexadecimal digit represents 4 bits, making it a quick way to shorten and understand long binary numbers.

### 5- What kind of relationship does a byte have with a hexadecimal value?

**A byte** is 8 bits which is two nibbles. Since each nibble matches one hexadecimal digit a byte can be represented by two hexadecimal digits.

**6- An IPv4 subnet is 32-bit, show with a calculation why this is the case.**

**An IPv4** address is made up of four numbers separated by dots. Each of these four numbers is one **octet** meaning it has 8 bits. Since there are four octets, an IPv4 address has a total of **8×4=32 bits.**

## Assignment 1.2: Your favourite colour

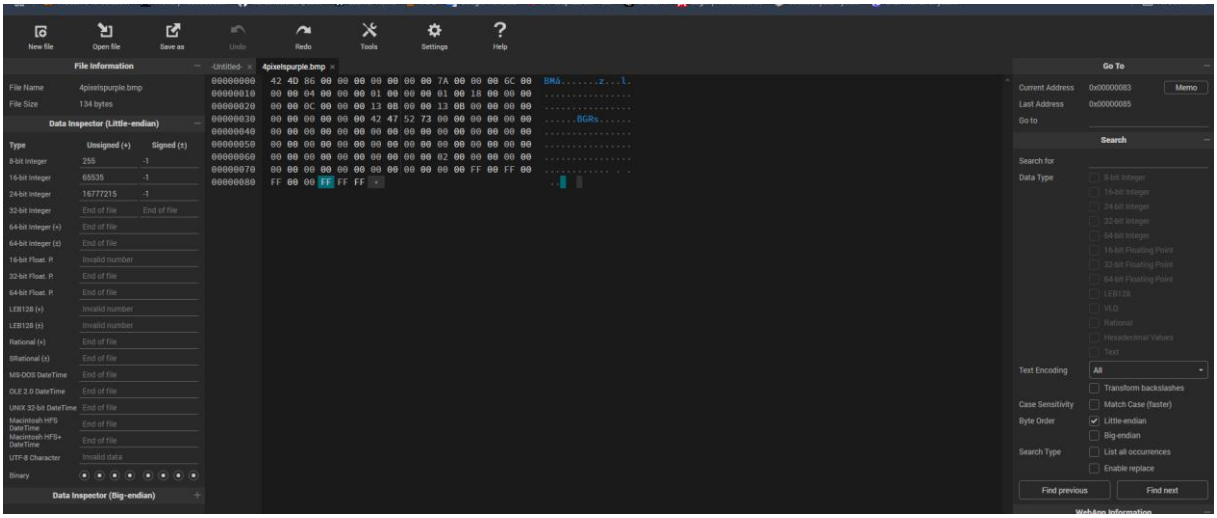
**1- Hexadecimal colour code: 6e1fab**

## Assignment 1.3: Manipulating binary data

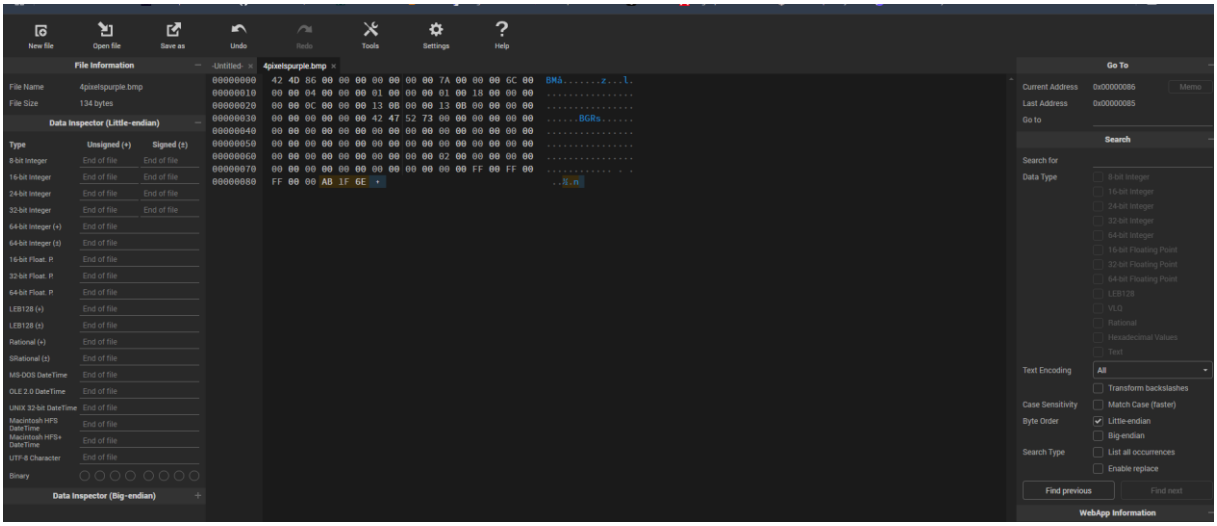
| Colour | Colour code hexadecimaal (RGB) | Big Endian | Little Endian |
|---|---|---|---|
| **RED** | FF0000 | FF 00 00 | 00 00 FF |
| **GREEN** | 00FF00 | 00 FF 00 | 00 FF 00 |
| **BLUE** | 0000FF | 00 00 FF | FF 00 00 |
| **WHITE** | FFFFFF | FF FF FF | FF FF FF |
| **Favourite (Purple)** (previous assignment) | 6E1FAB | 6E 1F AB | AB 1F 6E |

**Screenshot modified BMP file in hex editor:**

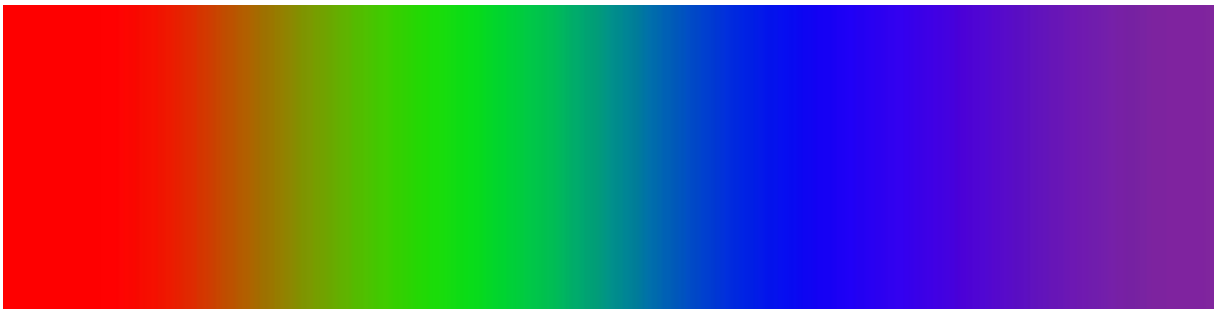
**Before editing my favourite colour code:**




**After editing my favourite colour code:**



## This is a “BMP” file:



**As you can see in the last picture, the white colour is replaced by my favourite colour (purple).**

## Bonus point assignment – week 1

Convert your student number to a hexadecimal number and a binary number.

568403 ÷ 2 = 284201, remainder 1

284201 ÷ 2 = 142100, remainder 1

142100 ÷ 2 = 71050, remainder 0

71050 ÷ 2 = 35525, remainder 0

35525 ÷ 2 = 17762, remainder 1

17762 ÷ 2 = 8881, remainder 0

8881 ÷ 2 = 4440, remainder 1

4440 ÷ 2 = 2220, remainder 0

2220 ÷ 2 = 1110, remainder 0

1110 ÷ 2 = 555, remainder 0

555 ÷ 2 = 277, remainder 1

277 ÷ 2 = 138, remainder 1

138 ÷ 2 = 69, remainder 0

69 ÷ 2 = 34, remainder 1

34 ÷ 2 = 17, remainder 0

17 ÷ 2 = 8, remainder 1

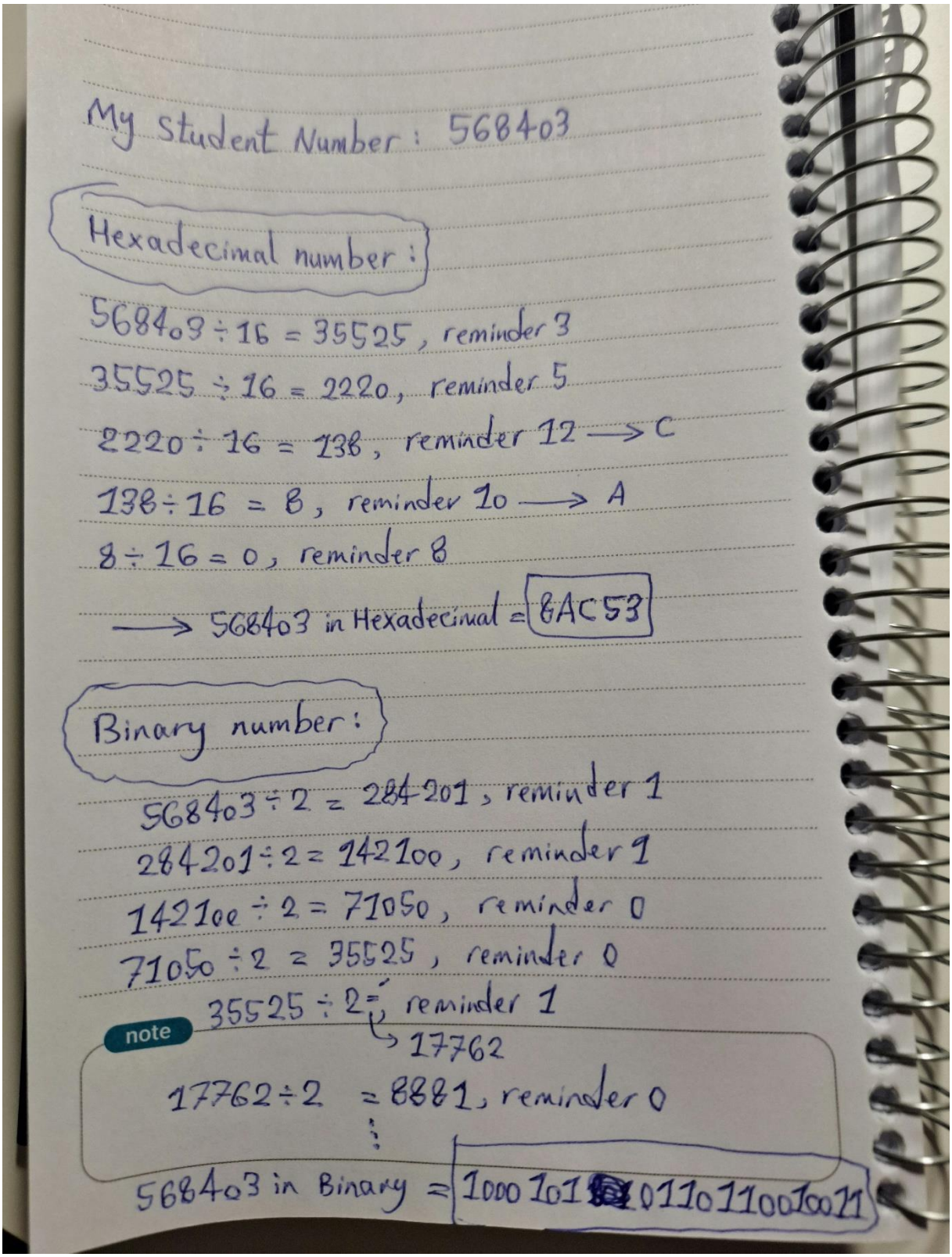
8 ÷ 2 = 4, remainder 0

4 ÷ 2 = 2, remainder 0

2 ÷ 2 = 1, remainder 0

1 ÷ 2 = 0, remainder 1

**My student number in binary: 10001011010101000011**




**Explain in detail that the calculation is correct. Use the PowerPoint slides of week 1:**

**The explanation is in the picture, which I will explain in the classroom.**

Ready? Save this file and export it as a pdf file with the name: **week1.pdf**

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**Course: IT Fundamentals**